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per cent of a potato crop is made up of culls, such as small, scabby, and broken tubers—all of them easily made up into potato starch for home use. The interesting thing is that you can take that 10 or 20 per cent of otherwise unprofitable potatoes and run them through a food grinder or chopper at home or in a community coöperative center, and by putting it through three or four washes you can bring out of it a pure white starch—a splendid exercise for the school to teach the children, a splendid thing for the home to start. This potato starch will become a splendid substitute for wheat. For those who know how to bake bread, 20 per cent of the flour now used in the bread, custards, pies, cakes and other dishes, may be made from potato starch taken from these cull potatoes which would otherwise be wasted.

In conclusion may I urge upon you all the necessity of increasing the interest in every community in our *junior food soldiers* and in the building of adequate food fortifications, above all help us patriotically in the development of the four-square world citizens, boys and girls, achievement crowned, because of opportunities given them by a thoughtful and efficient leadership.

THE WORK CONDUCTED BY THE COMMERCIAL CANNERS OF THE COUNTRY

By W. D. BIGELOW,

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The preservation of food by sterilization in hermetically sealed containers was suggested over a hundred years ago. For forty years the process was chiefly confined to the home, and it was only in the middle of the last century that commercial canning passed the experimental stage. Its history as an industry, therefore, dates back only about sixty-five years.

The canning industry is one of the great movements in connection with the manufacture of food which has necessarily accompanied the changing economic conditions of the century. From a household method used mainly to preserve what was left over of raw products grown for other purposes, there has been developed an industry using raw products grown especially for can-

ning. Canning factories, at first located in cities, are now usually found in the country or in small towns surrounded by a farming community in which the particular products they are designed to pack can be grown to best advantage. Much progress has been made in the direction of preparing products of uniform character to suit a particular trade.

During the early days of the industry the methods employed were held as secrets and carefully guarded, even from the employes of the plant. As the industry developed, it gradually became evident that canners were all guarding substantially the same information, so that the policy of secrecy in technical operations was of little, if any, value. It not only afforded little protection against competition, but it prevented the possibility of conference which might often be helpful.

Gradually, therefore, the policy of trade secrets was replaced by one of conference and collaboration in technical matters. Finally it became apparent that more progress could be made by systematic study and that laboratory methods would be of advantage. Accordingly, in 1913, a laboratory was established for the purpose of investigating canning processes in order that the difficulties of manufacture might be eliminated, costs of manufacture reduced, amount of spoilage decreased and products improved.

This laboratory has had the close coöperation and active support of the industry and has already completed several investigations which are believed to be helpful. Its most ambitious work has been a collaborative study with the laboratories of the American Can Company and the American Sheet and Tin Plate Company of the relative value of different weights of tin coating on canned food containers. This work was undertaken for the purpose of determining the minimum amount of tin coating which should be employed to keep the food from coming in contact with the steel of the can and thus imparting to the food an undesirable appearance and possibly an undesirable flavor. The idea then was to be sure that enough tin was used. The importance of conserving tin by preventing the use of an excessive amount was regarded as secondary. Since that time, our need of tin has increased to such an extent as to sorely tax the world's supply and it becomes of the utmost importance that the weight of coating be not excessive.

In addition to research problems studied by the laboratory,

samples are received daily from members of the National Canners' Association illustrating the difficulties they are having and asking for help in overcoming them. The experience of the laboratory makes it possible to answer many of these questions and thus eliminate great loss from spoilage that would otherwise occur.

One of the difficulties with which the canning industry has had to contend is a prejudice against canned foods due to lack of information on the subject. This prejudice takes various forms. The majority of consumers give little attention to defining the grade and quality of canned foods they prefer. In making a purchase, they merely ask for a can of peas or a can of corn. As they do not know what to ask for, they are inclined to take the cheapest. The result is that they are likely to receive an article which is over-mature and for that reason of low commercial grade and cheap. The product is wholesome. Its nutritive value is probably as high and, with some articles, is likely to be higher than that of the highest commercial grade of the same article, which sells for twice the price. It is likely, however, to be less succulent and tender than if the product had been harvested a day or two earlier.

The canning industry recognizes the need of some fundamental change that will assist consumers in buying canned foods of the character and quality they prefer. The subject presents great difficulties. There is no uniformity in labeling. There are commercial grades which have a meaning in the trade, but often the labels give no indication by which the consumer can know the character of the product. Many foods are difficult to describe in terms that can be understood by one who has not given the matter special study.

A movement has been inaugurated by the National Canners' Association to correct this difficulty. Standards have already been adopted for canned peas which, when placed on the label, will give the consumer exact information regarding the quality of the product. It is not expected that these standards will take the place of trade names, but that they will be used in addition to whatever other designation is desired. Some packers have begun to use these grades on their labels. Others are ready to do so when the trade demands it. How soon they will come into general use depends on the consumer.

It may not be possible in other lines of food to adopt as exact

definitions as those that have been adopted for peas, but great advance can be made over the present labels and the question is being actively studied. If the consumer will do his part, the label can soon be made "the window of the can "

The subject of food poisoning—or ptomaine poisoning as it is popularly called—is only partly and vaguely understood. It is known that illness of this type is often due to microorganisms with which the food is contaminated and the identity of some of these organisms has been established.

A comprehensive survey of the subject has not been made, however, and food poisoning may sometimes be due to varieties of microorganisms or other factors whose agency has not yet been suspected. Our lack of information on this subject is probably owing largely to its complexity and to the difficulties involved in its study. For instance, in the case of those microorganisms known to produce food poisoning, the period of incubation has not been accurately determined, but is believed to vary from a number of hours to several days—perhaps as much as a week. When a case of food poisoning occurs, therefore, the food that caused it is rarely available for study. Because of the state of our information on this subject, many cases of illness, arising from entirely different causes, have been attributed to food poisoning.

The need of a comprehensive investigation of the subject has long been recognized. For some time such a study has been contemplated by the canning industry, but its adequate organization involved great difficulties. Finally, within the last year, the National Research Council consented to organize the investigation.

They designated as director Dr. M. J. Rosenau, Professor of Preventive Medicine and Hygiene of the Harvard Medical School, and appointed an advisory commission consisting of the following well-known men:

- Dr. J. J. Abel, Professor of Pharmacology, Johns Hopkins University
- Dr. Reid Hunt, Professor of Pharmacology, Harvard University
- Dr. E. O. Jordan, Professor of Bacteriology, University of Chicago
- Dr. Lafayette B. Mendel, Professor of Chemistry, Sheffield Scientific School,
Yale University
- Dr. F. G. Novy, Professor of Bacteriology, University of Michigan
- Dr. H. G. Wells, Professor of Pathology, University of Chicago
- Dr. Eugene L. Opie, Professor of Pathology, Washington University

The actual laboratory work was begun several months ago and is being actively carried on by a corps of trained workers at the Harvard Medical School. The National Canners' Association has donated to Harvard University a fund sufficient to finance the investigation for three years.

When the United States was drawn into the European War, it became evident at once that the demand for canned foods must far exceed the supply. Even before that time, the amount of some products was insufficient. It was obvious that the purchase of such supplies by the old process of competitive bidding would lead to interminable delay and would not secure satisfactory results. It was obvious also that orders must be given for the army and navy which would be larger than any one agency could supply. In such cases bidders must secure the refusal of the goods desired and base their bids on such refusals. Thus many inquiries would be made for the purpose of filling a single order. In this state of affairs the real demand could not be gauged and prices would be inflated in our general market as well as for the supplies of the army and navy.

The first inquiries of this nature were for evaporated milk. The manufacturers had been unable to fill their orders for some time and did not desire to bid. There resulted a consultation within the industry in which it was arranged that the needs of the government for this product should be supplied for materially less than the market price. The orders were apportioned among the various manufacturers in proportion to the amount packed by each, and the quality of each shipment was guaranteed. Instead of the delay that has heretofore attended such purchases, these orders are given priority over all others and the milk is shipped at once. This plan was found so satisfactory that the manufacturers were asked to supply milk on the same basis to the American Red Cross and the Committee for Relief in Belgium. As preparations for the war progressed, a general procedure, based on this same arrangement, was adopted for the purchase of the principal staples.

Under this plan packers are instructed by the Council of National Defense to withhold from sale a certain percentage of their pack of each of the canned products which the government desires to purchase. For instance, the packers of peas were asked to hold 12 per cent of their entire pack; packers of tomatoes 18 per cent;

and packers of string beans 25 per cent. These goods are then ordered as they are desired by the army and navy.

Special arrangements are made by a committee of experts not connected with the canning industry to inspect these goods and see that they comply with specifications, the packers being required, at the suggestion of their own organization, to comply with the specifications fixed. On all of these purchases the prices are not the subject of agreement but are fixed by the Federal Trade Commission, which ascertains the cost of manufacture by means of a staff of expert accountants who visit the canning factories. These prices are well below the contract prices which govern the sale of the same commodities in the usual channels of trade.

During the present year 800,000 cases of evaporated milk, costing about \$4,000,000, are being used by the American Red Cross and the Committee for Relief in Belgium. The army and navy use at least as much. There is being exported for the use of our allies at least \$10,000,000 worth of milk per year.

The estimates of the army and navy for the present year include something like \$6,000,000 for tomatoes and \$2,000,000 each for salmon, peas and corn. The amount of money that will be expended for canned meat cannot now be estimated, but will probably be between \$15,000,000 and \$20,000,000.

The pack of 1916 was short in most articles. There are no stocks in the hands of packers or jobbers and the supply on retailers' shelves is low. It is apparent, therefore, that the volume of canned foods needed in connection with the war must curtail the supply of our civilian population.

The attempt of canners to secure largely increased acreage was only partly successful. Many farmers discontinued or reduced their acreage of canners' crops because of the high prices prevailing for corn and wheat. Others were deterred from large plantings of canners' crops by the scarcity of help, and planted crops for whose harvesting less labor was required. Late frosts killed the first plantings in some districts and new plants could not be obtained. The season is very late, and already frost has visited some localities. An early general frost would be disastrous to the pack of many products. The labor situation is one of extreme difficulty. The canning industry cannot compete with the high wages of the munitions manufacturers and has lost much of its best help for that reason.

Its ranks have been further depleted by the organization of the army. The actual canning operations are therefore conducted this year with unusual difficulty. Moreover, as often happens in late seasons, the height of the season is marked by a glut of some products that taxes the canning plants to their utmost capacity. Notwithstanding these handicaps, it is expected that between five and six billion cans of food will be packed in the United States this year.

The supply of tin is giving much concern. Early in the present year there was a great scarcity of tin plate, owing to the inability of platemakers to secure a supply of steel. It is probable that the amount of tin plate actually made into cans was no less than in preceding years, but the cans were used as soon as manufactured for baked beans and war rations for European armies. Consequently, when the canning season approached, it appeared that there might not be a sufficient number of cans to take care of the crop.

At the request of the Department of Agriculture and the Department of Commerce, a special effort was made to increase the manufacture of tin plate, and canners ceased to pack non-perishable goods, such as baked beans and macaroni, until a sufficient supply of plate was assured for the manufacture of cans necessary to preserve perishable foods.

Thus far there has been no scarcity of tin. It appears possible, however, that the supply of pig tin may not be adequate for the summer of 1918. Great difficulty attends its production in Singapore owing to the labor situation, and it is possible that the present output of that region cannot be increased. The same is true of other Oriental sources. There is ample tin in Bolivia which until very recently it has not been possible to refine. Lately, practical methods for refining Bolivian tin have been devised. One firm is now turning out from Bolivian ore a tin of the highest grade of purity at the rate of 600 tons a month, and it is hoped that this output can be increased. Notwithstanding this increase, however, it is feared that the supply of tin for 1918 will not be sufficient to meet our needs.